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(54) Drum-type washing machine

(57) A drum-type washing machine (1), the washing drum (4) of which is mounted for rotation in a container (5) for detergent solution, has a detergent dispenser (2) for the addition of powdery and/or liquid treatment agents which are flushed into the container (5) for detergent solution by means of the fresh water flowing in. The container (5) for detergent solution has a drainage system which consists of a bellows-like drain socket (6), a pump (8) for detergent solution and a drain hose (9). Disposed in the drain socket is a valve device (11) which closes this during the introduction of the treatment agents. The valve device (11) is formed from a mechanically stable valve flap (15) of plastics material which is held in the closed position by the hydrostatic pressure of water in the drain hose (9) or in the drainage system.

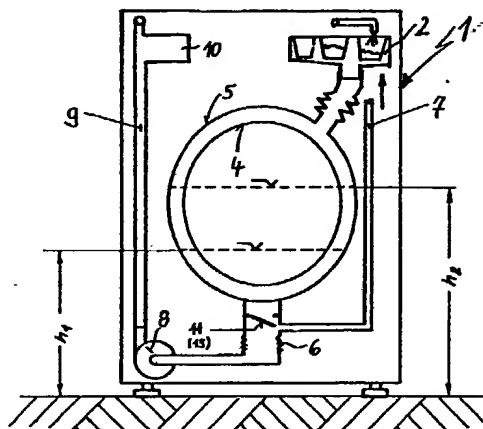


Fig. 1

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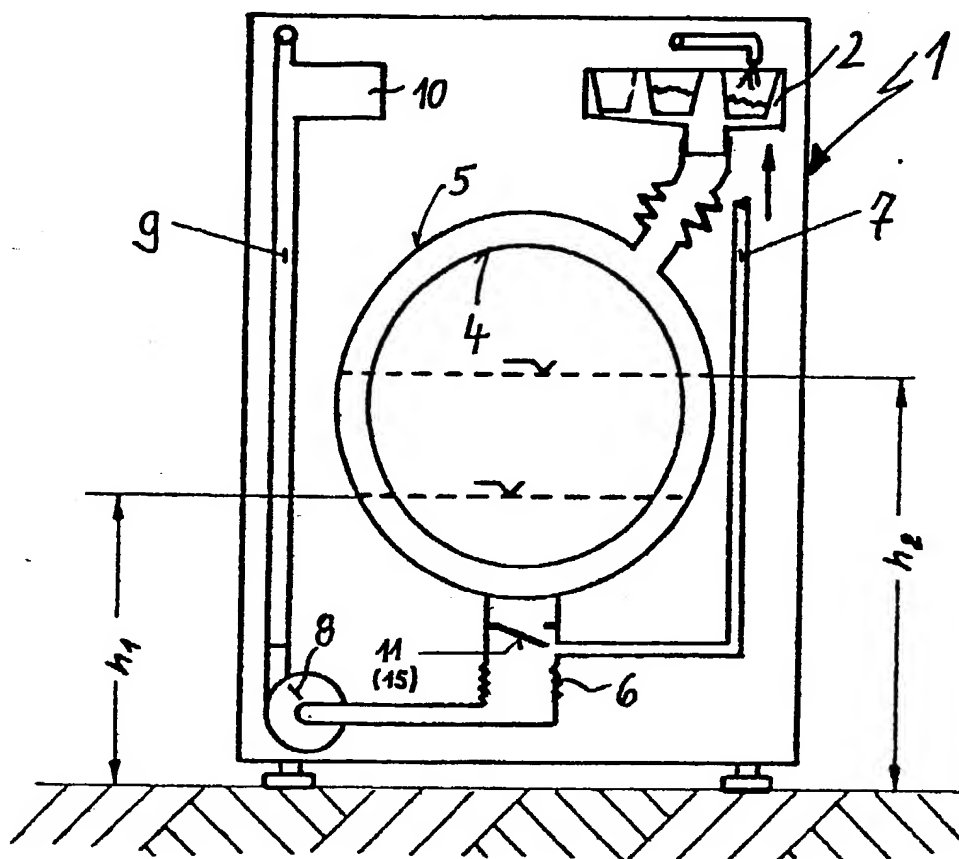


Fig. 1

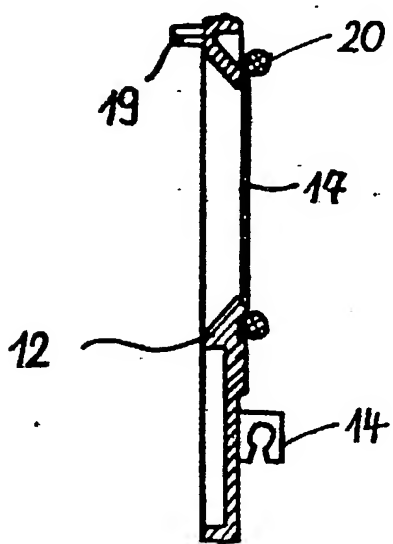


Fig. 7

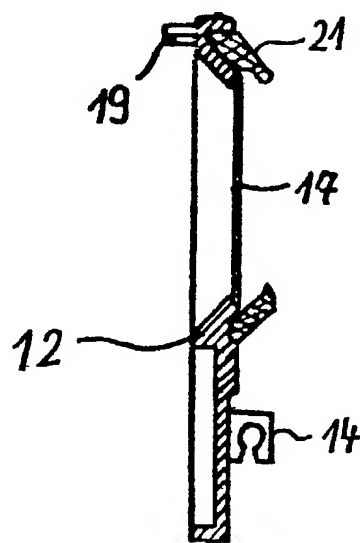


Fig. 8

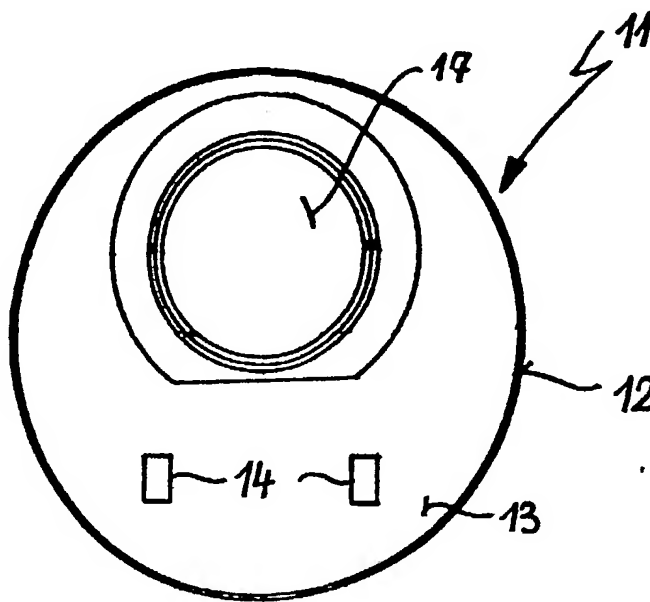


Fig. 2

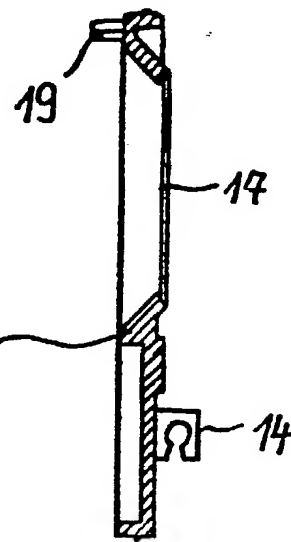


Fig. 4

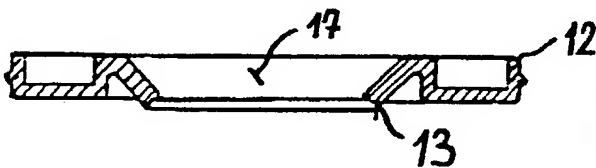


Fig. 5

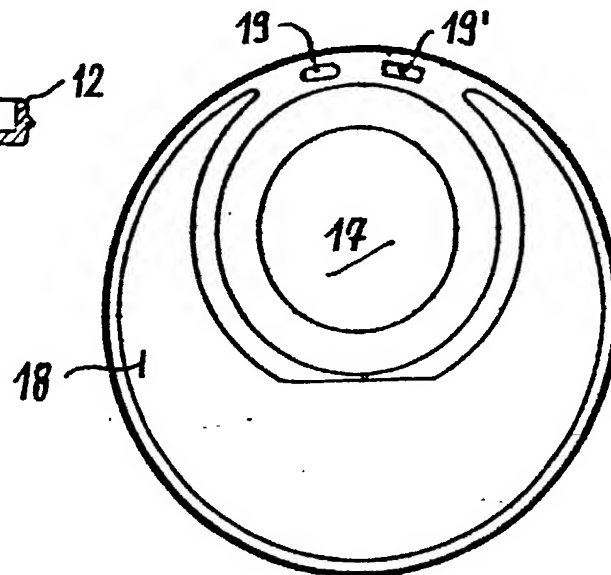


Fig. 3

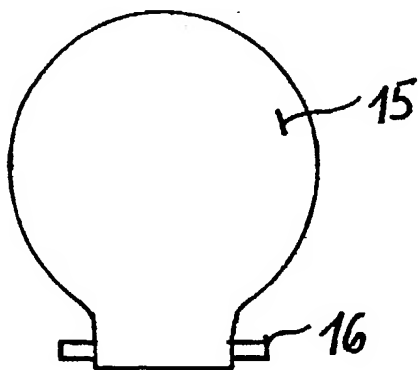


Fig. 6

## SPECIFICATION

## Drum-type washine machine

5 The invention relates to a drum-type washing machine of the kind in which the laundry drum is mounted for rotation in a container for detergent solution, a detergent dispenser is provided for the addition of powdery and/or liquid treatment agents  
 10 which are flushed out into the container for detergent solution by means of a fresh water flowing in, the container for detergent solution is coupled to a discharge system comprising a bellows-like drain outlet with a vent pipe, a pump for the detergent  
 15 solution and a discharge hose, and there is disposed in the drain outlet a valve device for closing the outlet during the introduction of the treatment agent.

In the washing machines usual today, the problem still arises of achieving a better utilization of the  
 20 detergents and conditioning agents used. A considerable loss of detergent may be caused, in particular, by the fact that the detergent introduced settles in the discharge system and flows away unused during the following pumping-out operation. In order to counter-  
 25 act this disadvantageous phenomenon, numerous proposals have already become known but either did not lead to the desired result or were not realizable in practice.

Thus a washing machine of the type in question is  
 30 known for example from the DE-GM 78 13 695 wherein disposed in the bellows-like drain outlet of the container for detergent solution is a sealing valve device consisting of a hollow plastics ball by means of which the flow of the detergent solution through  
 35 towards the pump is either blocked or freed. A feed pipe, which is in communication with the fresh water supply, is connected to the pump for detergent solution. Here the fresh water running into the washing machine does not run first into the detergent  
 40 dispenser but is conveyed through the feed pipe directly into the bellows-like drain outlet. When a sufficient amount of fresh water has run into the bellows-like drain outlet, the hollow plastics ball of the sealing valve device is brought into its sealing position  
 45 and held in this position by the hydrostatic water pressure. Thus the entry of water into the bellows-like drain outlet from the container for detergent solution is prevented. Fresh water, and with this the treatment agent (detergent) is now supplied to the container for  
 50 detergent solution. Furthermore, a washing machine is known from the DE-OS 22 29 505 having a device for preventing the loss of detergent which consists in that a certain water column, acting against the water outlet in the container for detergent solution, is constantly  
 55 maintained in the drain outlet.

As already mentioned, none of these known devices yet produces the desired effect. In addition, these devices are comparatively complicated in construction and are also extremely susceptible to trouble.  
 60 It is the object of the invention to provide a drum-type washing machine having a simple device to prevent the loss of detergent and fabric softener which does not have the disadvantage existing in the prior art and which works reliably.

65 In accordance with the invention, in a washing

machine of the kind initially referred to, the valve device is formed from a mechanically stable valve flap of synthetic plastics materials which is held in the closed position by the hydrostatic water pressure in the discharge hose or in the drainage system.

70 The arrangement in accordance with the invention has the advantage that the valve device works more reliably and ensures a greater utilisation of the detergent than in the above mentioned arrangement of the prior art.

75 The invention is illustrated by way of example in the accompanying drawings, in which:

Figure 1 is a diagrammatic elevation showing a drum-type washing machine in sufficient detail to  
 80 explain the invention.

Figures 2 and 3 show the bottom and top of a valve support plate of the machine of Fig. 1,

Figure 4 is a vertical section, and

Figure 5 is a horizontal section through the valve support plate as viewed in Fig. 2,

85 Figure 6 is a plan view of a valve flap which can be fitted on the valve support plate, and

Figures 7 and 8 are sectional elevations corresponding to Fig. 4 of modified forms of the valve support plate with associated sealing elements.

90 Referring to the drawings, the drum-type washing machine 1 has, in its upper region, a detergent dispenser 2 of known construction to receive powdery and/or liquid treatment agents. A fresh water supply  
 95 pipe 3 to the detergent dispenser 2 is controlled, depending on a programme, by a solenoid valve, not illustrated, in the usual manner. The laundry drum 4 of the drum-type washing machine 1 is mounted for rotation in a container 5 for detergent solution. At the  
 100 bottom, the container 5 for detergent solution has a bellows-like (flexible) drain outlet 6 to which a vent pipe 7 is connected. The bellows-like drain outlet 6 establishes a connection to a pump 8 which effects the emptying of the container 5 for detergent solution and  
 105 to which a discharge hose 9 is fitted. A small additional container 10 may appropriately be disposed or formed in the discharge hose 9 in order to enlarge its capacity. The bellows-like drain socket 6 is equipped with a flap valve device 11, the details of which are illustrated  
 110 more fully in Figures 2 to 6. This flap valve device is intended to prevent detergent from being able to get into the illustrated discharge system of the drum-type washing machine when the detergent is flushed out of the detergent dispenser 2, from which system it is  
 115 conveyed into the sewer network without being used for the washing operation.

The above-mentioned flap valve device 11 in the bellows-like drain socket 6 consists of a valve support plate 12 which can be inserted in the drain outlet 6 and centred there and of which the under side 13, which is directed towards the pump 8, carries two bearing  
 120 members 14, formed thereon, for the articulate mounting of a rigid valve flap 15 consisting of plastics material. For this purpose, the valve flap 15 is provided with corresponding pivot pins 16, when bearing  
 125 against the under side 13 of the valve carrier plate 12, tightly covers a flow passage 17 formed in this. Two pins 19, 19' situated side by side are formed on the top 18 of the valve support plate 12.

130 The flap-valve device 11 for preventing the escape

or loss of detergent from the container 5 for detergent solution works in the following manner: that the pump 8 for detergent solution (discharge pump) is controlled so that, after it is switched off, the level  $h_2$  both in the appropriately dimensioned drain hose 9 and in the vent pipe 7 is always higher, with sufficient certainty, than the maximum level  $h_1$  during any washing programme of the machine, that is to say  $h_2$  must always be greater than  $h_1$ . Thus the valve flap 15 is pressed against its valve seat by the hydrostatic pressure of water present and the flow passage 17 in the valve support plate 12 is closed. Thus the detergent flushed out of the detergent dispenser 2 into the container 5 for detergent solution remains in the container 5 for detergent solution and cannot be deposited in the drainage system of the washing machine.

In order to increase the sealing action of the valve flap 15, in the region of the flow passage 17 in the valve support plate 12, this may be equipped or provided with an appropriate sealing surface. Such a sealing surface may consist of an added sealing member or of an applied resilient coating. The same purpose would also be achieved by fitting a seal to the valve support plate 12. In this case, this may consist of an annular sealing member 20 (Figure 7) or a lip seal 21 (Figure 8) of the most varied construction.

#### CLAIMS

1. A drum-type washing machine, the laundry drum of which is mounted for rotation in a container for detergent solution, which has a detergent dispenser for the addition of powdery and/or liquid treatment agents to be flushed out into the container for detergent solution by means of fresh water flowing in, and in which the container for detergent solution is coupled with a discharge system including a drain outlet, a discharge pump and a discharge hose, there being disposed in the drain outlet a valve device which is formed as a mechanically stable valve flap of synthetic plastics material which is arranged to be held in the closed position during the introduction of treatment agent into said container for detergent solution by the hydrostatic water pressure in the said discharge hose, or in the drainage system.

2. A drum-type washing machine as claimed in Claim 1, wherein the mechanically stable valve flap is articulately mounted on a valve support plate centred in a bellows-like drain outlet and having a flow passage.

3. A drum-type washing machine as claimed in Claim 2, wherein bearing members or bearing brackets are provided to mount the valve flap on the valve support plate.

4. A drum-type washing machine as claimed in any preceding Claim, wherein pivot pins are formed on the valve flap.

5. A drum-type washing machine as claimed in any preceding Claim, wherein the valve flap is provided with a sealing surface which consists of an added sealing member or an applied resilient coating.

6. A drum-type washing machine as claimed in Claim 2, wherein a seal consisting of an annular member or a lip seal is provided on the valve support plate.

7. A drum-type washing machine substantially as

described herein with reference to Figs. 1—6 of the accompanying drawings.

8. A drum-type washing machine substantially as described herein with reference to Figs. 1—6 as modified by Fig. 7 or 8 of the accompanying drawings.

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